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Growth and survival of budded Kinnow plants as influenced by different types of black polybags and soil media

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The experiment was carried out to standardize the black polybags with different soil media for production of budded Kinnow plants with treatments comprising four different sizes of black polybags and different soil media containing soil, sand, vermicompost and farm yard manure (FYM) in different proportions. The interaction effect of different potting material and propagation media showed that potting material viz. black polybags of size 22x10x8 cm with holes filled with propagation media soil: sand: vermicompost in the ratio of 1:1:1 reported maximum diameter of scion (0.89 cm), diameter of stock (2.76 cm), scion stock ratio (0.32), length of shoot (20.00 cm), number of shoot (11.81), number of leaves per scion (12.50) and height of plant (44.96 cm); whereas, soil temperature, electrical conductivity and soil texture were also observed highest. The cost of raising 10000 kinnow buddlings in black polybags of size 22x10x8 cm with holes filled with propagation media soil: sand: vermicompost in ratio of 1: 1: 1 was estimated as Rs 54321.00.

Key words: Kinnow, black polybags, soil media, growth and economics.

INTRODUCTION

Kinnow mandarin (*Citrus reticulata* Blanco), member of family Rutaceae, is one of the popular fruit among various citrus species. Among various citrus species, it has greater heat tolerance than other citrus species; a character inherited from its parent cultivar *king tangor* which allows it to survive in hot summers with maximum temperatures around 48°C. The fruit become popular among citrus growers by virtue of its excellent desert quality, characteristic aroma, pleasing appearance in addition to the cultivar's precocious bearing habit and adaptability to adverse weather conditions.

In India, citrus is grown as field nursery. In field nurseries, the eradication of soil borne pathogens like Phytophthora once introduced becomes very difficult. To avoid this problem, the concept of containerised nursery system was adopted. Natural development of the root system remains more or less intact in polybags which ensures better growth, helps the trees resist strong winds and gives better drought protection in the initial years. The increased root length of container grown seedlings allows better performance and survival under adverse conditions than bare root (Amidon et al., 1982). Interest in

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producing quality planting material by application of improved and modern nursery technique has increased in recent years (Gera and Ginwal, 2002). Therefore, it has become imperative to standardize the black polybags with different soil media for raising budded Kinnow plants.

MATERIALS AND METHODS

The study was carried out in the experimental farm of the Division of Fruit Science, Faculty of Agriculture, SKUAST-J Udheywalla Jammu, during the year December 2011/2012 to February 2012/2013. Udheywalla is situated in the sub-tropical zone at latitude of 32°40°N and longitude of 74°58°E. The altitude is 300 m above mean sea level. Annual precipitation is about 1200 mm. The winter month experiences mild to severe cold and temperature ranges from 6.5 to 21.70°C. December is the coldest month with minimum temperature and evaporation rate goes as low as 4.0°C; however the maximum, minimum temperature and evaporation rate rises from March onwards. In order to study the growth characteristics of the budded kinnow plants, the rootstock seedlings were procured. The rootstock seedlings used for the budding of kinnow plants was one and half year old having uniform vigour and of pencil thickness at the time of budding. Seedling rootstock was budded during spring season. Four different black polybags viz. C_1 black polybags of size 25×13×10 cm with holes, C_2 black polybags of size 22×10×8 cm with holes, C_3 black polybags of size 17×7×6 cm with holes and C_4 Nursery bed (Size = 1×1 m) filled with six different propagation medias viz. M_1 Soil: FYM 2:1, M_2 Soil: Sand: FYM 1:1:1, M_3 Soil: Sand: FYM 2:1:1, M_4 Soil: Vermicompost 2:1, M_5 Soil: Sand: Vermicompost 1:1:1and M_6 Soil: Sand: Vermicompost 2:1:1 were used forming 24 numbers of treatments. The treatments were arranged in a Factorial Randomized Block Design with three replications and the data generated during the course of study was subjected to statistical analysis as prescribed by Panse and Sukhatme (2000).

By considering the growth of budded kinnow plants, vegetative parameters like diameter of the scion and stock of five budded kinnow plants was measured using a digital vernier caliper at 30, 60, 90, 120, 150 and 180 days after planting and was expressed in centimeters. The length from the collar region to the tip of the shoot apex was measured for five randomly selected plants in each treatment and expressed in centimetres, number of shoots per plant of five budded kinnow plants was recorded at 30, 60, 90, 120, 150 and 180 days for six months after planting. All the shoots on the bud-scions were counted and average number of shoots per plant was calculated, number of leaves of five budded kinnow plants was recorded at 30, 60, 90, 120, 150 and 180 days for six months after planting. On each plant, all the leaves irrespective of their sizes were counted and average numbers of leaves per plants were calculated. The height of the budded kinnow plants was recorded at 30, 60, 90, 120, 150 and 180 days for six months after planting. The linear growth (height) was measured from ground level to the tip of the main axis with the help of scale and expressed as an average plant height in centimeter (cm).

RESULTS AND DISCUSSION

The maximum scion diameter (0.89 cm) was recorded at 180 days after transplanting in black polythene bag of size 22x10x8 cm with holes filled with soil: sand: vermicompost (1:1:1) in Table 1. These results are in line with the findings of Bahuguna and Pyarelal (1990) in *Acacia nilotica*, who reported the addition of FYM and vermicompost, recorded maximum growth of plants in the nursery.

The maximum diameter of stock (2.76 cm) in Table 2 was recorded at 180 days after transplanting in black polybags of size 22 x 10 x 8 cm with holes filled with soil: sand: vermicompost (1:1:1). It follows in Table 3 then, that the maximum scion stock ratio (0.32) was observed in treatment C_2M_5 (black polybags of size 22 x 10 x 8 cm with holes) filled with soil: sand: vermicompost (1:1:1). These results are in consonance with Ouma (2006), who reported that increase in container volume increases plant growth parameters such as height of plants, stem diameter in rough lemon seedlings.

Maximum shoot length (20.0 cm) was recorded at 180 days after transplanting in treatment C_2M_5 (black polybags of size 22 x 10 x 8 cm with holes filled with soil: sand: vermicompost 1:1:1) presented in Table 4. This increase in the shoot growth might be due to the conducive effect of this medium mixture on porosity, soil aeration and supplying sufficient nutrients particularly nitrogen, and micro nutrients required for good root and shoot growth (Chopde et al., 1999). Maximum number of shoots (11.81 cm) were recorded at 180 days after transplanting in treatment C_2M_5 (black polybags of size 22x10x8 cm with holes filled with soil: sand: vermicompost 1:1:1) presented in Table 5. This may be due to the larger container volume, which led to increased development of primary shoots and their number and total length of all shoots increased (Alvarez and Caula, 1993) resulting in increased plant height and canopy size.

Maximum number of leaves per shoot (12.50) were recorded at 180 days after transplanting in treatment C_2M_5 (black polybags of size 22x10x8 cm with holes filled with soil: sand: vermicompost 1:1:1) presented in Table 6. The increased leaves per shoot might be the result of availability of nutrients from added organic matter. These results are supported by Alvarez and Caula (1993) who found that the increase in number of leaves was due to the content of higher volume of rooting media which increased development of primary shoots and their number.

Maximum height of the plant (44.96 cm) at 180 days after transplanting in treatment C_2M_5 (black polybags of size 22x10x8 cm with holes filled with soil: sand: vermicompost 1:1:1) is presented in Table 7. The results are in consonance with Chatterjee and Choudhuri (2007) who reported that vermicompost provides close contact between seed and media, increases steady moisture supply facilitates root respiration and encourages overall root growth. They observed that at large volumes of container, there was increased development of primary shoots and their number and total length of all shoots increased which caused increased heights of plants (Alvarez and Caula, 1993).

Perusal to the data presented in Table 8 showed that maximum soil temperature was observed (36°C) in the black polybags with holes and treatments comprising

Table 1. Interaction effect of black polybags and potting mixtures on diameter of scion (cm) at different intervals for six months on budded kinnow plants.

Treatment	30 days	60 days	90 days	120 days	150 days	180 days
Black polybags x Potting mixtures						
C_1M_1	0.23	0.27	0.34	0.41	0.50	0.59
C_1M_2	0.35	0.37	0.45	0.52	0.60	0.69
C_1M_3	0.34	0.36	0.44	0.51	0.59	0.68
C_1M_4	0.29	0.31	0.39	0.46	0.54	0.63
C_1M_5	0.43	0.47	0.53	0.66	0.75	0.84
C_1M_6	0.42	0.45	0.52	0.65	0.74	0.83
C_2M_1	0.25	0.29	0.37	0.43	0.52	0.61
C_2M_2	0.39	0.41	0.49	0.58	0.67	0.76
C_2M_3	0.38	0.40	0.48	0.56	0.65	0.74
C_2M_4	0.31	0.33	0.41	0.48	0.56	0.65
C_2M_5	0.47	0.52	0.61	0.71	0.80	0.89
C_2M_6	0.46	0.51	0.57	0.70	0.79	0.88
C_3M_1	0.24	0.28	0.36	0.42	0.51	0.60
C_3M_2	0.37	0.39	0.47	0.54	0.63	0.72
C_3M_3	0.36	0.38	0.46	0.53	0.62	0.71
C_3M_4	0.30	0.32	0.40	0.47	0.55	0.64
C_3M_5	0.45	0.50	0.56	0.69	0.78	0.87
C_3M_6	0.44	0.49	0.55	0.68	0.77	0.86
C_4M_1	0.22	0.26	0.33	0.40	0.49	0.58
C_4M_2	0.33	0.35	0.43	0.50	0.58	0.67
C_4M3	0.32	0.34	0.42	0.49	0.57	0.66
C_4M_4	0.28	0.30	0.38	0.44	0.52	0.62
C_4M_5	0.41	0.43	0.51	0.63	0.72	0.81
C_4M_6	0.40	0.42	0.50	0.60	0.69	0.78
C.D	N.S	0.03	0.02	0.02	0.02	0.02

C_1M_2, C_2M_2, C_2M_5, C_3M_5 respectively, after transplanting of budded kinnow plants to the open field. The Table 8 also indicates the maximum electrical conductivity (29 µm) in the black polybags with holes in the treatments C_1M_5 and C_2M_6 respectively. It follows then that maximum sand percentage (84%), silt percentage (20.14 %) and clay percentage (7.51 %) was recorded after transplanting of budded kinnow plants to the open field with the treatment comprising C_2M_5 (black polybags of size 22x10x8 cm with holes filled with soil: sand: vermicompost 1:1:1) presented in Table 8.

The economics for producing 10000 budded kinnow plants in black polybags of size 22 x 10 x8 cm with holes filled with soil: sand: vermicompost (1:1:1) revealed that maximum gross income (Rs. 198000), net return (Rs. 143679) and C: B ratio (1:2.74) was observed in black polybags of size 22x10x8 cm with holes filled with propagation media soil: sand: vermicompost (1:1:1), Table 9.

These results are in conformity with findings of Ravikumar (2007) and Pramod (2007).

Conclusion

It can be concluded that the black polybags of size 22 x 10 x 8 cm with holes filled with soil: sand: vermicompost (1:1:1) was found to be best for nursery raising of budded kinnow plants and the relative economics for producing 10000 budded kinnow plants in black polybags is calculated to be Rs. 54321 for which cost of planting single kinnow plant in black polybags cost to Rs. 5.24.

Table 2. Interaction effect of black polybags and potting mixtures on diameter of stock (cm) at different intervals for six months on budded kinnow plants.

Treatment	30 days	60 days	90 days	120 days	150 days	180 days
Black polybags x Potting mixtures						
C_1M_1	1.10	1.25	1.43	1.63	1.81	2.05
C_1M_2	1.65	1.80	1.98	2.18	2.36	2.46
C_1M_3	1.55	1.70	1.88	2.08	2.26	2.36
C_1M_4	1.32	1.47	1.65	1.85	2.03	2.13
C_1M_5	1.91	2.06	2.24	2.44	2.62	2.72
C_1M_6	1.89	2.04	2.22	2.42	2.60	2.70
C_2M_1	1.23	1.38	1.56	1.76	1.94	2.30
C_2M_2	1.81	1.96	2.14	2.34	2.52	2.62
C_2M_3	1.77	1.92	2.10	2.30	2.48	2.58
C_2M_4	1.40	1.55	1.73	1.93	2.11	2.21
C_2M_5	1.95	2.10	2.28	2.49	2.66	2.76
C_2M_6	1.94	2.09	2.27	2.47	2.65	2.75
C_3M_1	1.20	1.35	1.53	1.73	1.92	2.08
C_3M_2	1.64	1.79	1.97	2.17	2.35	2.45
C_3M_3	1.68	1.83	2.01	2.21	2.39	2.49
C_3M_4	1.35	1.50	1.68	1.88	2.06	2.16
C_3M_5	1.93	2.08	2.26	2.46	2.64	2.74
C_3M_6	1.92	2.07	2.25	2.45	2.63	2.73
C_4M_1	1.00	1.15	1.33	1.53	1.71	2.04
C_4M_2	1.53	1.68	1.86	2.06	2.24	2.34
C_4M3	1.46	1.61	1.79	1.99	2.17	2.27
C_4M_4	1.29	1.44	1.62	1.82	2.00	2.10
C_4M_5	1.88	2.03	2.21	2.41	2.59	2.69
C_4M_6	1.84	1.99	2.17	2.37	2.55	2.65
C.D	0.07	0.03	0.07	0.03	0.02	0.07

Table 3. Interaction effect of black polybags and potting mixtures on scion stock ratio at different intervals for six months on budded kinnow plants.

Treatment	30 days	60 days	90 days	120 days	150 days	180 days
Black polybags x Potting mixtures						
C_1M_1	0.21	0.21	0.23	0.25	0.27	0.29
C_1M_2	0.21	0.20	0.23	0.23	0.25	0.28
C_1M_3	0.22	0.21	0.23	0.24	0.26	0.29
C_1M_4	0.22	0.21	0.23	0.24	0.26	0.30
C_1M_5	0.22	0.23	0.24	0.27	0.28	0.31
C_1M_6	0.22	0.22	0.23	0.27	0.28	0.31
C_2M_1	0.20	0.20	0.24	0.24	0.26	0.27
C_2M_2	0.21	0.21	0.23	0.25	0.27	0.29
C_2M_3	0.21	0.21	0.23	0.24	0.26	0.28
C_2M_4	0.22	0.21	0.23	0.25	0.26	0.30
C_2M_5	0.24	0.24	0.27	0.29	0.30	0.32
C_2M_6	0.23	0.24	0.25	0.28	0.30	0.32
C_3M_1	0.19	0.20	0.23	0.24	0.26	0.29
C_3M_2	0.23	0.21	0.24	0.25	0.27	0.30
C_3M_3	0.21	0.21	0.23	0.24	0.26	0.29
C_3M_4	0.22	0.21	0.24	0.25	0.26	0.30
C3M5	0.23	0.24	0.25	0.28	0.29	0.32

Table 3. Contd.

C_3M_6	0.22	0.24	0.24	0.28	0.29	0.31
C_4M_1	0.21	0.23	0.24	0.26	0.28	0.29
C_4M_2	0.21	0.21	0.23	0.24	0.25	0.28
C_4M3	0.22	0.21	0.23	0.24	0.26	0.29
C_4M_4	0.21	0.21	0.23	0.24	0.26	0.29
C_4M_5	0.22	0.21	0.23	0.26	0.28	0.30
C_4M_6	0.21	0.21	0.23	0.25	0.27	0.29
C.D	N.S	0.02	0.02	0.02	0.01	0.02

Table 4. Interaction effect of black polybags and potting mixtures on length of shoot (cm) at different intervals for six months on budded kinnow plants.

Treatment	30 days	60 days	90 days	120 days	150 days	180 days
Black polybags x Potting mixtures						
C_1M_1	1.08	1.75	6.55	9.20	13.00	17.86
C_1M_2	1.88	2.45	7.25	9.85	13.68	18.45
C_1M_3	1.80	2.40	7.20	9.75	13.61	18.39
C_1M_4	1.40	2.04	6.80	9.54	13.21	18.05
C_1M_5	2.38	2.94	7.74	10.42	14.24	19.10
C_1M_6	2.30	2.86	7.66	10.37	14.12	19.00
C_2M_1	1.26	1.86	6.73	9.36	13.10	17.92
C_2M_2	2.10	2.70	7.50	10.16	14.00	18.80
C_2M_3	2.05	2.65	7.45	10.08	13.92	18.75
C_2M_4	1.59	2.18	7.00	9.60	13.39	18.23
C_2M_5	2.60	3.20	8.00	11.00	15.10	20.00
C_2M_6	2.55	3.15	7.98	10.64	14.42	19.60
C_3M_1	1.18	1.80	6.60	9.30	13.05	17.90
C_3M_2	2.00	2.55	7.38	10.00	13.92	18.72
C_3M_3	1.94	2.57	7.35	9.90	13.84	18.50
C_3M_4	1.50	2.15	6.95	9.58	13.38	18.10
C_3M_5	2.48	3.08	7.95	10.60	14.40	19.30
C_3M_6	2.42	3.02	7.80	10.50	14.26	19.20
C_4M_1	1.00	1.70	6.50	9.00	12.75	17.40
C_4M_2	1.72	2.30	7.10	9.74	13.50	18.35
C_4M3	1.65	2.20	7.05	9.66	13.46	18.28
C_4M_4	1.35	2.00	6.75	9.42	13.20	18.00
C_4M_5	2.25	2.82	7.60	10.28	14.09	18.98
C_4M_6	2.17	2.77	7.55	10.27	14.03	18.86
C.D	0.02	0.04	0.03	0.04	0.05	0.06

Table 5. Interaction effect of black polybags and potting mixtures on number of shoot at different intervals for six months on budded kinnow plants.

Treatment	30 days	60 days	90 days	120 days	150 days	180 days
Black polybags x Potting mixtures						
C_1M_1	1.03	1.33	1.58	1.85	2.11	2.45
C_1M_2	1.40	2.49	4.20	4.65	4.78	5.12
C_1M_3	1.37	2.48	3.67	3.99	4.50	4.84
C_1M_4	1.20	1.67	2.54	2.71	2.89	3.23
C_1M_5	1.72	4.40	6.13	6.86	7.38	7.72

Table 5. Contd.

C_1M_6	1.62	4.22	6.08	6.54	6.95	7.29
C_2M_1	1.09	1.48	2.28	2.31	2.87	3.21
C_2M_2	1.48	3.30	5.55	5.83	5.69	6.03
C_2M_3	1.47	3.16	5.03	5.28	5.58	5.92
C_2M_4	1.25	2.07	2.67	2.79	3.32	3.68
C_2M_5	2.47	5.60	8.92	10.03	11.47	11.81
C_2M_6	2.00	4.93	8.59	9.21	9.50	9.84
C_3M_1	1.07	1.42	1.72	2.29	2.33	2.67
C_3M_2	1.44	3.02	4.86	4.91	5.19	5.53
C_3M_3	1.42	2.58	4.76	4.75	4.97	5.31
C_3M_4	1.23	1.93	2.58	2.75	3.00	3.34
C_3M_5	1.88	4.80	7.13	7.72	8.61	8.95
C_3M_6	1.80	4.55	6.82	7.26	7.67	8.01
C_4M_1	1.00	1.15	1.44	1.49	1.53	1.87
C_4M_2	1.33	2.33	3.44	3.75	3.83	4.17
C_4M3	1.28	2.20	3.10	3.50	3.55	3.89
C_4M_4	1.13	1.55	2.29	2.64	2.83	3.17
C_4M_5	1.53	3.63	6.04	6.04	6.38	6.72
C_4M_6	1.50	3.43	5.70	5.87	6.19	6.53
C.D	N.S	0.10	0.03	0.03	0.03	0.04

Table 6. Interaction effect of black polybags, potting mixtures on number of leaves per shoot at different intervals for six months on budded kinnow plants.

Treatment	30 days	60 days	90 days	120 days	150 days	180 days
Black polybags x Potting mixtures						
C_1M_1	2.60	3.45	3.72	5.00	7.75	10.75
C_1M_2	2.79	3.64	4.14	5.90	8.73	11.46
C_1M_3	2.78	3.63	4.08	5.85	8.50	11.38
C_1M_4	2.70	3.55	3.83	5.59	8.02	11.00
C_1M_5	2.90	3.75	4.62	6.30	9.24	12.00
C_1M_6	2.88	3.73	4.50	6.26	9.18	11.96
C_2M_1	2.66	3.50	3.76	5.50	7.86	10.90
C_2M_2	2.83	3.68	4.38	6.10	9.00	11.76
C_2M_3	2.82	3.67	4.30	6.05	8.96	11.68
C_2M_4	2.72	3.58	3.94	5.64	8.16	11.15
C_2M_5	3.00	3.85	4.80	6.72	9.50	12.50
C_2M_6	2.98	3.83	4.74	6.66	9.43	12.20
C_3M_1	2.63	3.48	3.74	5.45	7.80	10.86
C_3M_2	2.81	3.66	4.25	6.00	8.90	11.60
C_3M_3	2.80	3.65	4.18	5.96	8.84	11.58
C_3M_4	2.71	3.57	3.88	5.60	8.09	11.04
C_3M_5	2.95	3.80	4.70	6.60	9.38	12.14
C_3M_6	2.93	3.78	4.66	6.44	9.32	12.05
C_4M_1	2.55	3.40	3.70	4.98	7.60	10.56
C_4M_2	2.77	3.62	4.05	5.72	8.38	11.30
C_4M3	2.74	3.60	4.00	5.68	8.22	11.22
C_4M_4	2.67	3.53	3.80	5.55	7.92	10.97
C_4M_5	2.85	3.71	4.42	6.20	9.10	11.92
C_4M_6	2.84	3.70	4.35	6.18	9.04	11.80
C.D	0.02	0.02	0.04	0.03	0.03	0.03

Table 7. Interaction effect of black polybags, potting mixtures on height of plant (cm) at different intervals for six months on budded kinnow plants.

Treatment	30 days	60 days	90 days	120 days	150 days	180 days
Black polybags x Potting mixtures						
C_1M_1	16.00	17.72	20.27	23.57	26.57	27.82
C_1M_2	18.30	20.85	23.95	27.82	31.28	34.68
C_1M_3	17.98	20.60	23.85	27.50	31.18	34.63
C_1M_4	17.05	19.05	21.85	26.07	29.12	32.04
C_1M_5	20.60	23.62	27.53	30.86	35.10	39.19
C_1M_6	20.51	23.59	27.42	30.72	34.98	39.07
C_2M_1	16.40	18.26	20.99	24.01	27.22	30.32
C_2M_2	19.30	22.16	25.50	29.03	33.05	36.44
C_2M_3	18.65	21.96	25.45	28.90	32.86	36.39
C_2M_4	17.45	19.63	22.63	27.00	30.44	33.66
C_2M_5	22.65	25.80	29.80	34.86	39.96	44.96
C_2M_6	22.56	25.76	29.75	34.52	38.94	43.23
C_3M_1	16.11	17.91	20.51	23.91	26.66	29.43
C_3M_2	18.55	21.35	24.49	28.72	32.64	36.18
C_3M_3	18.54	21.06	24.20	28.40	32.35	36.06
C_3M_4	17.08	19.23	22.18	26.69	30.08	33.36
C_3M_5	21.36	24.22	27.88	31.38	35.56	39.96
C_3M_6	20.85	23.79	27.57	31.26	35.50	39.48
C_4M_1	15.97	17.70	20.20	21.72	24.82	29.06
C_4M_2	17.91	20.38	23.61	27.33	30.94	34.40
C_4M3	17.71	20.36	23.58	27.06	30.50	33.89
C_4M_4	16.70	18.74	21.49	24.65	27.85	30.91
C_4M_5	19.83	22.60	26.20	29.87	33.96	37.81
C_4M_6	19.35	22.53	26.08	29.16	33.16	37.05
C.D	0.03	0.04	0.03	0.03	0.03	0.03

Table 8. Interaction effect of black polybags, potting mixtures on soil physical characteristics on budded kinnow plants after six months of planting.

Treatment	Soil temperature (°C)	Electrical conductivity (µm)	Texture		
			Sand (%)	Silt (%)	Clay (%)
Black polybags					
C_1	34.67	26.28	79.50	14.03	6.03
C_2	35.06	26.83	80.26	14.64	6.25
C_3	34.72	25.66	80.03	14.35	6.17
C_4	32.71	25.99	79.10	13.78	5.87
C.D	0.42	0.12	0.17	0.13	0.05
Potting mixtures					
M_1	33.75	24.85	75.06	10.79	4.83
M_2	35.17	26.63	82.40	17.70	6.58
M_3	34.63	26.47	79.79	12.42	6.10
M_4	33.75	23.45	76.47	11.41	5.41
M_5	34.83	28.03	83.66	19.26	7.25
M_6	33.60	27.71	80.98	13.62	6.30
C.D	0.52	0.14	0.20	0.15	0.06
Black polybag x Potting mixtures					
C_1M_1	34.00	25.10	75.00	10.71	4.69

Table 8. Contd.

C_1M_2	36.00	26.70	82.11	17.74	6.54
C_1M_3	35.00	26.40	79.89	12.08	6.09
C_1M_4	34.00	23.60	76.33	11.17	5.37
C_1M_5	35.00	28.00	83.46	18.98	7.24
C_1M_6	34.00	27.85	80.22	13.48	6.27
C_2M_1	35.00	25.00	75.68	10.96	5.06
C_2M_2	36.00	27.40	82.89	17.88	6.76
C_2M_3	35.00	27.20	80.09	13.12	6.20
C_2M_4	34.33	24.00	76.99	11.70	5.60
C_2M_5	36.00	29.00	84.00	20.14	7.51
C_2M_6	34.00	28.40	81.92	14.03	6.35
C_3M_1	34.00	24.50	75.34	10.95	5.07
C_3M_2	35.67	26.12	82.58	17.78	6.63
C_3M_3	35.00	26.05	79.96	12.67	6.09
C_3M_4	34.00	23.00	76.67	11.58	5.53
C_3M_5	36.00	27.30	83.98	19.44	7.35
C_3M_6	33.67	27.00	81.66	13.68	6.34
C_4M_1	32.00	24.80	74.22	10.55	4.52
C_4M_2	33.00	26.30	82.00	17.40	6.39
C_4M3	33.50	26.22	79.20	11.80	6.02
C_4M_4	32.67	23.20	75.88	11.17	5.13
C_4M_5	32.33	27.80	83.20	18.47	6.92
C_4M_6	32.73	27.60	80.12	13.29	6.25
C.D	1.04	0.28	0.41	0.31	0.12

Table 9. Economics for producing 10000 budded kinnow plants in polybag of size 22 x 10 x 8 cm with holes filled with media Soil: Sand: vermicompost (1:1:1) ratio.

S. No.	Items of cost	Amount (Rs.)
	Variable cost	
1	Human labour (3 labour for 5 days @ Rs 160/day)	2400
2	Cost of polybags (10000) at 1300 per 1000 piece	13000
3	Cost of Vermicompost	1200
4	Plant protection chemicals	2000
5	Irrigation charges	1000
6	Interest on working capital at 10%	1960
	Total variable cost (V.C)	21560
	Fixed cost	
7	Permanent hired human labour	30000
8	Depreciation on assets	700
9	Estimation rental value of land	500
10	Land revenue	25
11	Interest on fixed capital at 6%	1536
	Total Fixed cost (F.C)	32761
	Total cost	54321
	Cost of planting single kinnow plant in polybag	54321/10000=5.24
	Return structure	
12	No. of seedlings	10000
13	Price per seedling	22
14	No of seedlings alive at 10% mortality	9000

Table 9. Contd.

Total value of output (seedlings)	198000
Net return (profit)	
Total cost of cultivation	54321
Gross income	198000
Net return	143679
C:B ratio	1: 2.74

Conflict of Interests

The author(s) have not declared any conflict of interests.

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